Docket No. 41-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT : KENNETH R. BOSLEY

SERIAL NO. : Unassigned ART UNIT: Unassigned

FILED : Herewith EXAMINER: Unassigned

FOR : SEAWATER PRESSURE-DRIVEN DESALINIZATION METHOD WITH GRAVITY-DRIVEN BRINE RETURN

TO THE HONORABLE DIRECTOR OF THE
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. Box 1450
Alexandria, Virginia 22313-1450
ATTENTION: Commissioner of Patents

PETITION TO MAKE SPECIAL

Dear Sir:

Applicant hereby petitions to make this application special pursuant to 37 C.F.R. 1.102(c) and MPEP § 708.02, on the grounds that the invention disclosed and claimed in the above-identified patent application will materially contribute to both (A) the discovery and development of energy resources, and (B) the more efficient utilization and conservation of energy resources. It accomplishes (A) by providing a new method for utilizing energy ultimately derived from the sun's radiation and the earth's gravitational field to desalinate seawater. It accomplishes (B) by reducing the amounted of electricity and/or fossil fuels needed to

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desalinate seawater. These claims are supported by the attached mathematical appendix.

This petition is submitted without any fee as permitted by 37 C.F.R. 1.102(c).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Sincerely yours,

Date December 1, 2003

Stephen C. Swift

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MATHEMATICAL APPENDIX

The Power Advantage Of an "At-Depth" Desalinization Plant Versus A Shore-Based Plant

Assumptions are as follows:

1. Both plants produce the same quantities of desalinated water.
2. The product water arrives at shore at the same pressure.
3. There is a method to return the brine (effluent) to the ocean.
4. The internal process is the same, the only difference in the facilities is the location.
5. The process requires a delta pressure of 850 psi across the element.
6. The pressure loss through the tube side, brine side (effluent), is 35 psi.
7. The process produces about a 30% yield of product, i.e., de-salinated water.
8. For simplicity the production will be based on 1 m^3 per second.

Calculations basic to both processes:
Product = 1 m^3/s therefore the initial supply of seawater = 1 m^3/s /.3 = 3.33 m^3/s
And by difference the effluent of brine = 2.33 m^3/s
As an approximation, 1 m^3/s water requires about 6.9 kW to raise the pressure by 1 psi.

I. Analysis of a typical shore based facility is as follows. It will be assumed that the shore-based facility can recapture enough excess energy from the effluent to do all auxiliary pumping and to overcome frictional losses. Also to be conservative it is assumed that frictional forces of the supply are so small as to be negligible. Therefore the entire energy cost will be assumed to be in pressurizing the supply, as follows:

3.33 m^3/s x 850 psi x 6.9 kW/(psi x m^3/s) = <u>19.5 MW</u>

II. Analysis of the "at-depth" plant will include a discussion of all pressure losses, since the process is streamlined and there is no excess energy from any part of the process. Only the desalinated (product) water need be pumped (pressurized) to the 850 psi level. The three parts to this equation are the effluent "make-up pressure", the product pumping, and the frictional losses due to the piping of the product to shore. The pipe can be sized to maintain a flow rate of about 1 m/s.

a. Product power requirement = 850 psi x 1 m^3/s x 6.9 kW/(psi x m^3/s) = <u>5.9 MW</u>
b. Effluent power requirement = 35 psi x 2.33 m^3/s x 6.9 kW/(psi x m^3/s) = <u>0.5 MW</u>
c. Power required to overcome frictional losses:
   friction loss = fluid density x coefficient of friction x length / diameter x velocity squared / 2

   Re = fluid velocity x pipe diameter x fluid density / dynamic viscosity
   Re = 1 m/s x 0.56 m x 1000 kg/m3 / 1000 x 10^{-6} Pa s = 5.6 x 10^5
   Relative Roughness = mean roughness / pipe diameter = .04mm / 0.56 m = 7.1 x 10^{-5}
   And therefore from standard tables the coefficient of friction is 0.014

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Therefore the frictional loss is:
$1000\ kg/m^3 \times .014 \times 11000\ m / .56\ m \times (1\ m/s)^2 / 2 = 138{,}000\ m/kg\ s^2 = 138000\ Pa$
$138000\ Pa \times 1\ psi / 6895\ Pa = 20\ psi$

And Frictional losses = 20 psi x 1 m^3/s x 6.9 kW/(psi x m^3/s) = <u>0.1 MW</u>

Therefore the total power requirement is:

5.9 MW + 0.5 MW + 0.1 MW = <u>6.5 MW</u> or 1/3 of the shore system's <u>19.5 MW</u>

Discussion:

1. Pumping efficiency was ignored for simplicity since the same inefficiencies would govern both systems equally and not change the statistical results.

2. For both systems the product required the entire 850 psi, therefore both systems have lost the 5.9 MW in forcing the separation process and it is non-recoverable.

3. The additional power required by the "at-depth" system is in adding "make-up pressure" to the effluent and overcoming frictional losses, together about 10% of the total power requirement.

4. The shore-based system pressurizes the entire supply to the 850 psi. More than 3 times the mass required by the "at-depth" system.

5. The "at-depth" system releases the effluent immediately at the end of the separation process, while the shore based system must return the effluent to a safe mixing zone with enough energy to ensure proper mixing, which requires more power.

6. If the shore based system were able to recycle as much as 50% of the "lost" power back into the system, then the "at-depth" system would still require only 2/3s as much power.

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